

# IMU

## Inertial Measurement Unit

WeGo Korea

## 목차

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2. IMU using Arduino & ROS

# 01

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## IMU Introduction

# Start 9DOF\_Razor\_IMU Sensor

DoF Razor의 MPU-9250에는 세 개의 3축 센서, 즉 가속도계, 자이로스코프, 그리고 선형 가속도, 각 회전 속도 및 자기장 벡터를 감지 기능

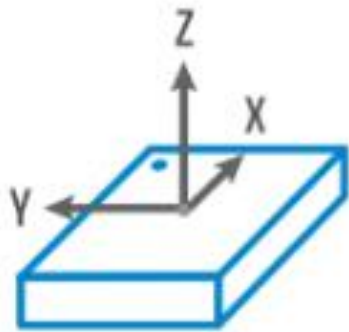
- SAMD21 마이크로 컨트롤러와 MPU-9250 센서를 결합하여 작고 프로그래밍 가능한 다목적 IMU 센서
- 시리얼 포트를 통해 모니터링하고 움직임을 로그 받고 Euler angle을 전송
- MPU-9250은 가속도계, 자이로스코프, 지자계를 탑재한 9 자유도 센서
- SAMD21은 32비트 ARM Cortex M0+ 마이크로 컨트롤러로 arduino zero, SAMD21 mini breakout 보드에 사용되는 MCU입니다.

# Start 9DOF\_Razor\_IMU Sensor

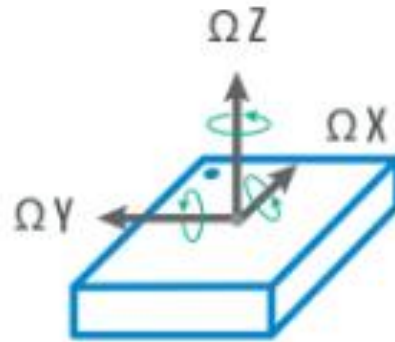
- microSD 슬롯, 리포 배터리 충전기, 파워 컨트롤 스위치 및 I/O 패드를 지원하여 센서 데이터 모니터링하는데 필요한 모든 것을 지원
- 아두이노 부트로더 및 예제 펌웨어가 탑재되어 있으며, 사용자 용도에 맞게 커스터마이제이션이 가능

# IMU\_Windows

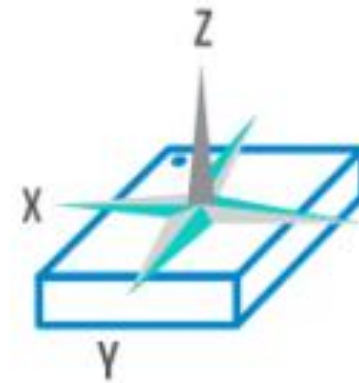
- IMU 자이로스코프 / 가속도계 / 지자기센서로 구성된 센서



Accelerometer



Gyroscope



Magnetometer

# IMU\_Windows

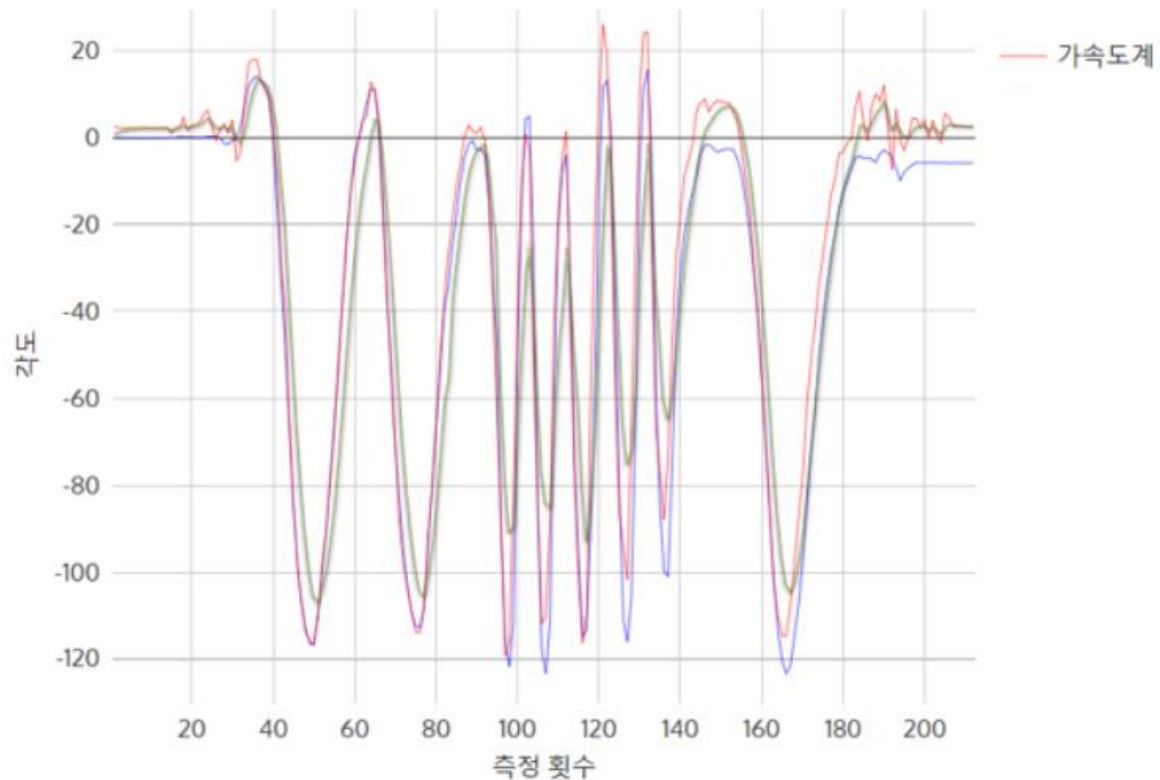
- IMU 자이로스코프  
일정한 방향으로 유지하려는 성질



# IMU\_Windows

- IMU 가속도계

물체의 가속도의 물리량을 측정하는 장치 (이동물체 및 충격의 세기)





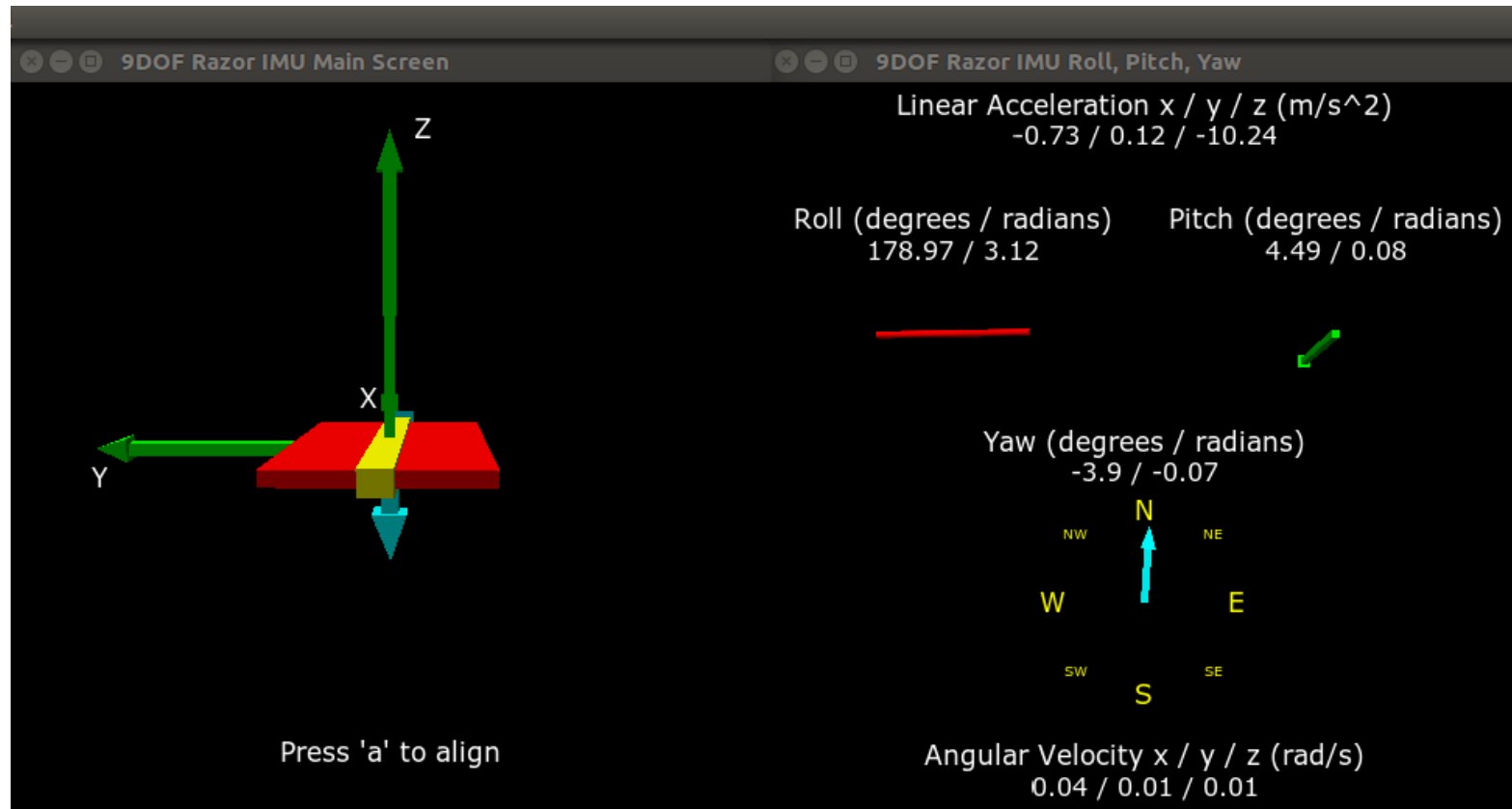
# 02

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IMU using ROS

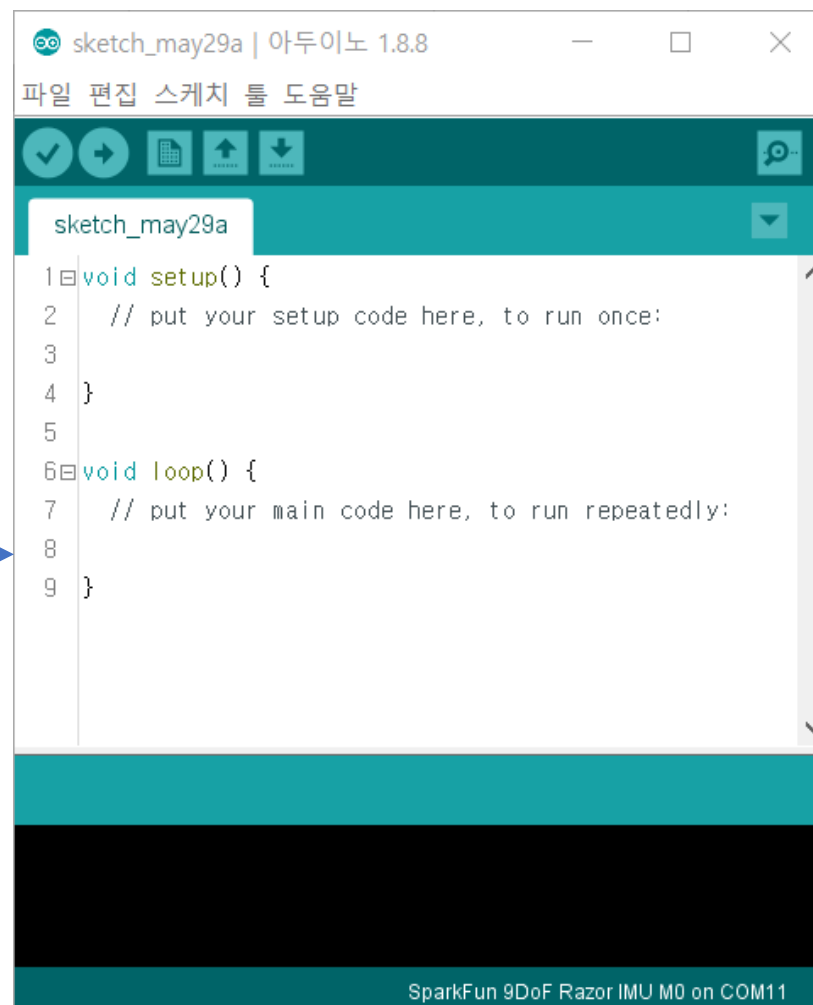
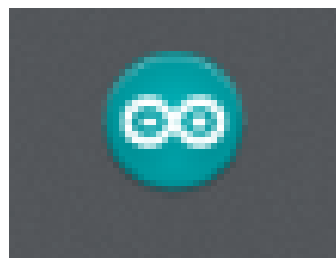
# IMU\_Windows

- IMU (Inertial Measurement Unit)



# IMU

- Arduino install

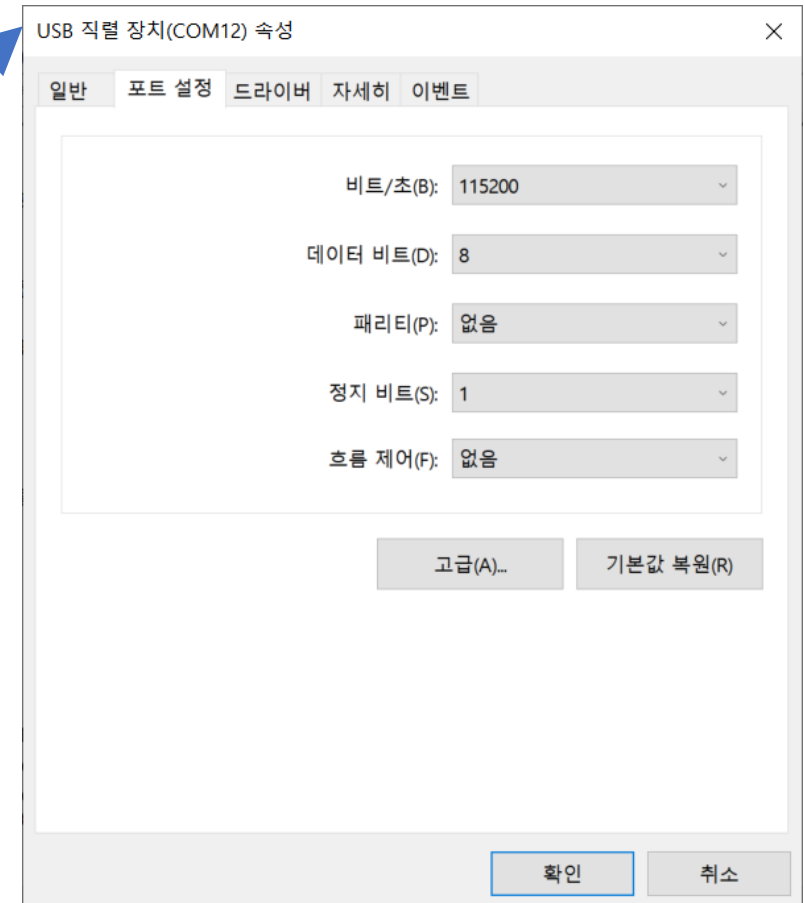
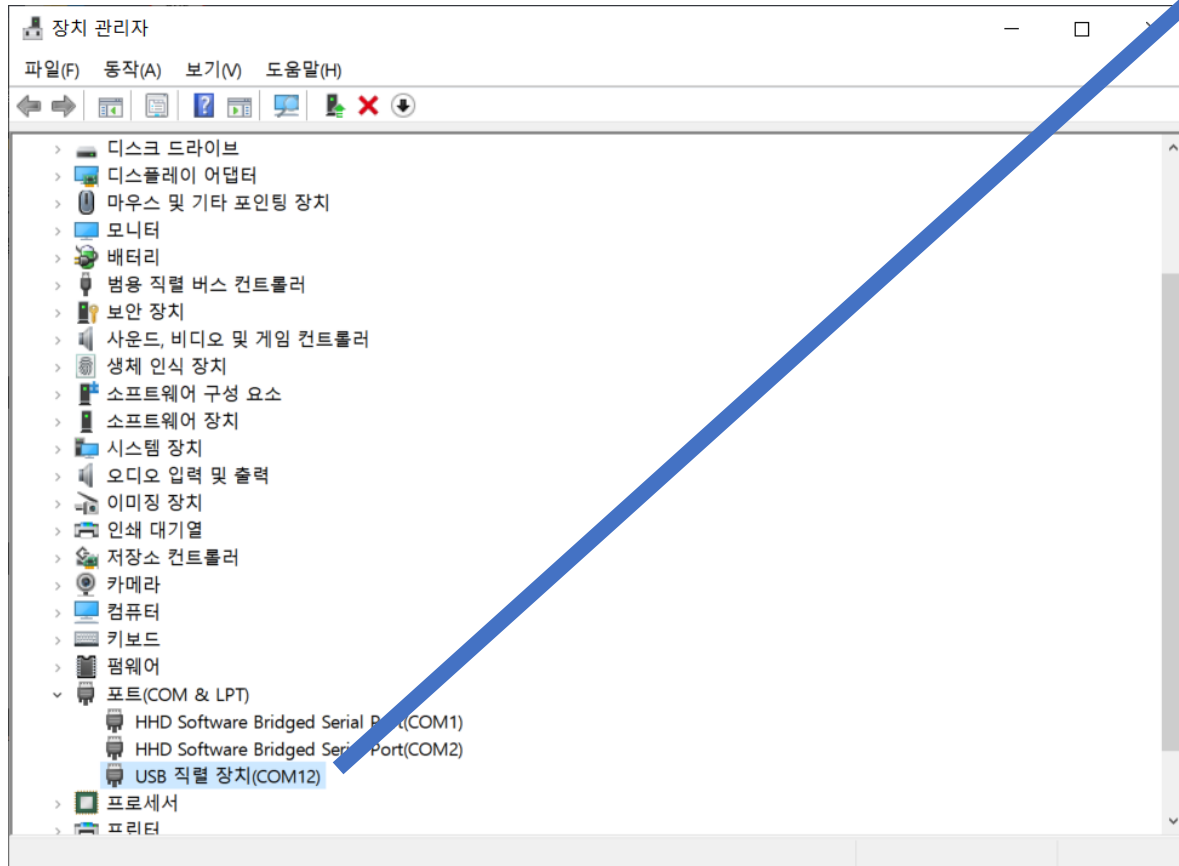
A screenshot of the Arduino IDE interface. The title bar shows 'sketch\_may29a | 아두이노 1.8.8'. The menu bar includes '파일', '편집', '스케치', '툴', and '도움말'. The toolbar contains icons for opening, saving, and uploading. The main editor window shows the following code:

```
1 void setup() {  
2   // put your setup code here, to run once:  
3  
4 }  
5  
6 void loop() {  
7   // put your main code here, to run repeatedly:  
8  
9 }
```

The status bar at the bottom indicates 'SparkFun 9DoF Razor IMU M0 on COM11'.

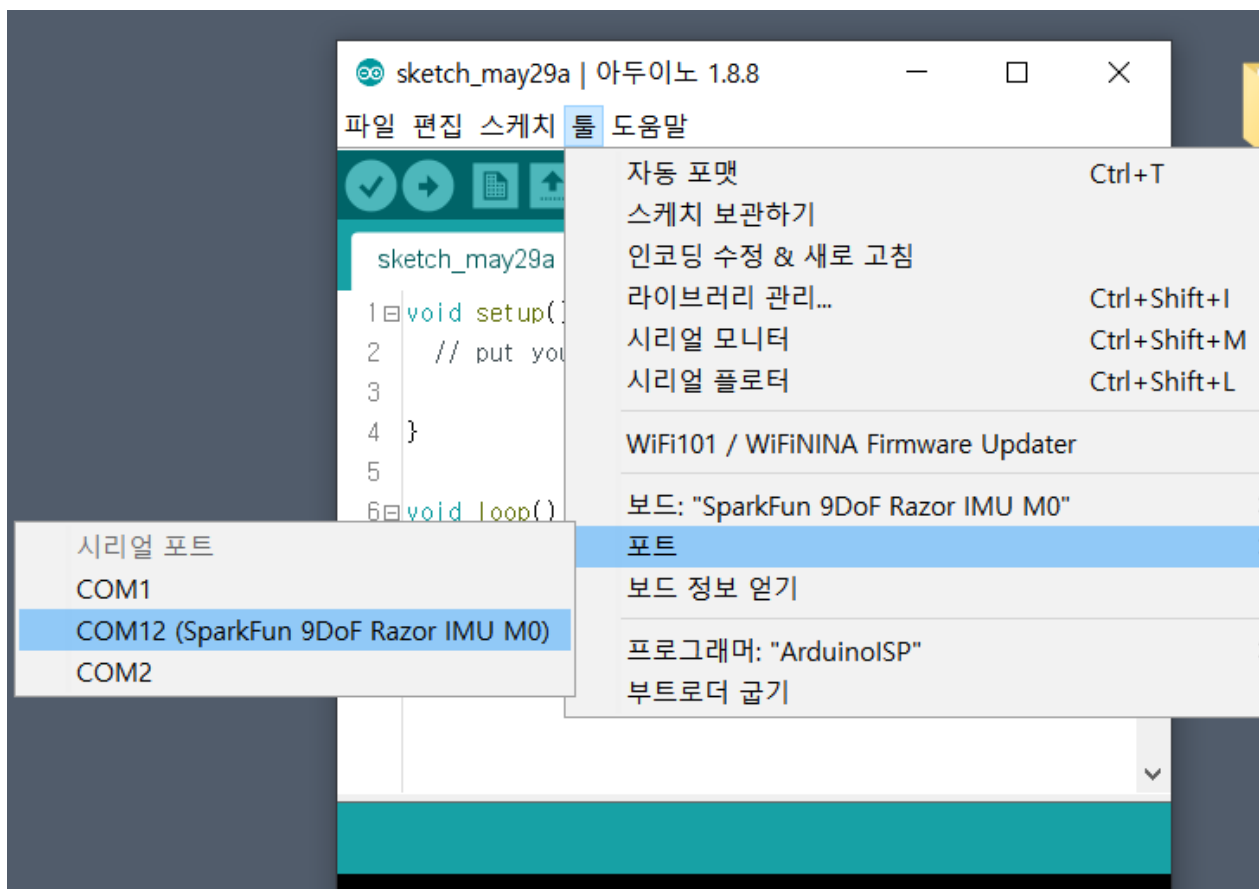
# IMU

## - 장치 관리자



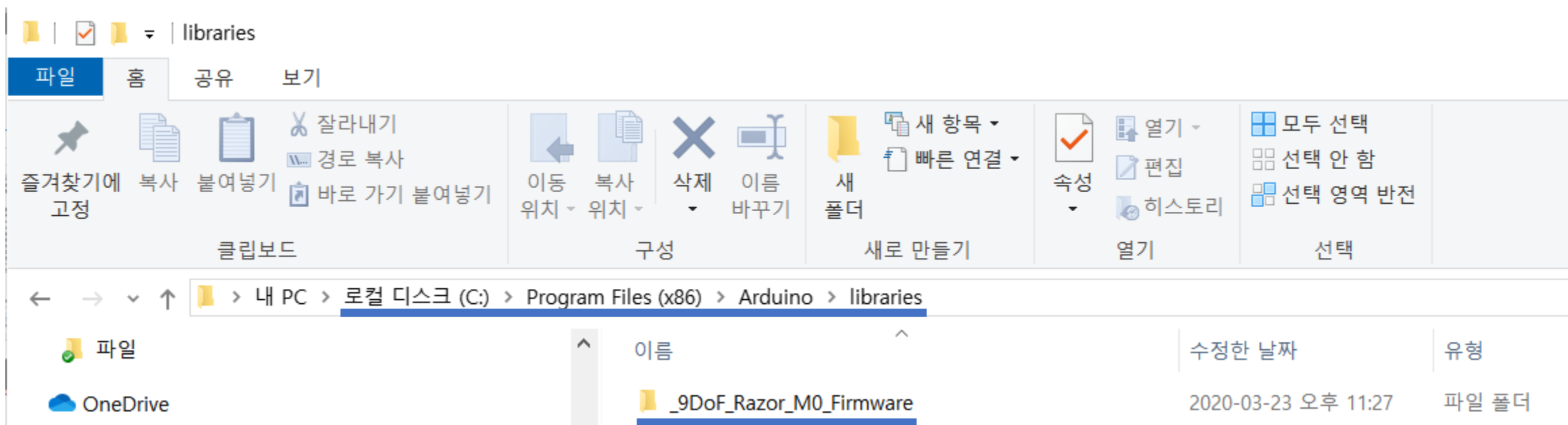
# IMU

## - Arduino Port Setting



# IMU

## Arduino\_라이브러리 추가



# IMU

Arduino\_Code 스케치



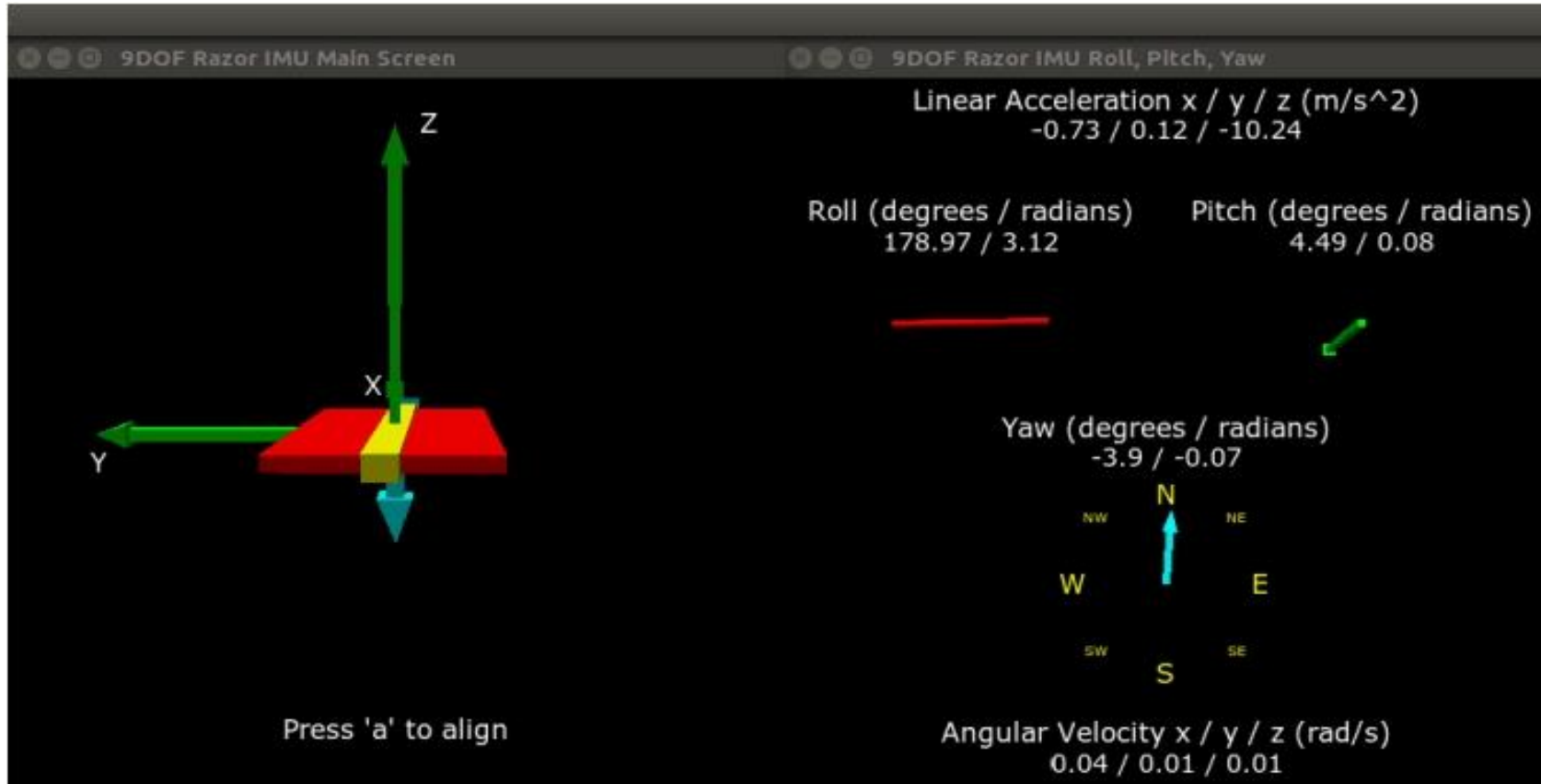
컴파일

```
1 //*****  
2 SparkFun 9DoF Razor M0 Example Firmware  
3 Jim Lindblom @ SparkFun Electronics  
4 Original creation date: November 22, 2016  
5 https://github.com/sparkfun/9DOF_Razor_IMU/Firmware  
6  
7 This example firmware for the SparkFun 9DoF Razor IMU  
8 demonstrates how to grab accelerometer, gyroscope, m  
9 and quaternion values from the MPU-9250's digital m  
10 (DMP). It prints those values to a serial port and,  
11 present, an SD card.  
12
```

```
209 //define HW_VERSION_CODE 10125 // SparkFun "9DOF Razor IMU" version "SEN-10125" (HMC5843 magnetometer)  
210 //define HW_VERSION_CODE 10736 // SparkFun "9DOF Razor IMU" version "SEN-10736" (HMC5883L magnetometer)  
211 //define HW_VERSION_CODE 14001 // SparkFun "9DOF Razor IMU" version "SEN-14001"  
212 //define HW_VERSION_CODE 10183 // SparkFun "9DOF Sensor Stick" version "SEN-10183" (HMC5843 magnetometer)  
213 //define HW_VERSION_CODE 10321 // SparkFun "9DOF Sensor Stick" version "SEN-10321" (HMC5843 magnetometer)  
214 //define HW_VERSION_CODE 10724 // SparkFun "9DOF Sensor Stick" version "SEN-10724" (HMC5883L magnetometer)  
215  
216  
217 // OUTPUT OPTIONS  
218 //*****  
219 // Set your serial port baud rate used to send out data here!  
220 #define OUTPUT_BAUD_RATE 57600  
221 #if HW_VERSION_CODE == 14001  
222 // Set your port used to send out data here!  
223 #define LOG_PORT SERIAL_PORT_USBVIRTUAL  
224 #else  
225 // Set your port used to send out data here!  
226 #define LOG_PORT Serial  
227 #endif // HW_VERSION_CODE  
228  
229 // Sensor data output interval in milliseconds  
230 // This way not work, if faster than 20ms (=50Hz)  
231 // Code is tuned for 20ms, so better leave it like that  
232 #define OUTPUT_DATA_INTERVAL 20 // in milliseconds  
233  
234 // Output mode definitions (do not change)  
235 #define OUTPUT_MODE_CALIBRATE_SENSORS 0 // Outputs sensor min/max values as text for manual calibration  
236 #define OUTPUT_MODE_ANGLES 1 // Outputs yaw/pitch/roll in degrees  
237 #define OUTPUT_MODE_SENSORS_CALIB 2 // Outputs calibrated sensor values for all 9 axes  
238 #define OUTPUT_MODE_SENSORS_RAW 3 // Outputs raw (uncalibrated) sensor values for all 9 axes  
239 #define OUTPUT_MODE_SENSORS_BOTH 4 // Outputs calibrated and raw sensor values for all 9 axes  
240 #define OUTPUT_MODE_ANGLES_AG_SENSORS 5 // Outputs yaw/pitch/roll in degrees + linear accel + rot. vel
```

# IMU

ROS\_pkg를 통해 publisher & subscriber





# IMU

## IMU\_Sensor Code

```
$ cd wecar-ws  
$ source devel/setup.bash  
$ roslaunch razor_imu_9dof razor_pub_and_display.launch
```